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BY

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Of Stanford University, California

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A REVIEW OF THE PŒCILIIDÆ OR KILLIFISHES OF JAPAN.

By David Starr Jordan and John Otterbein Snyder,

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In this paper is given a review of the species of *Pœciliidæ* or *Cyprinodontidæ*, found in the waters of Japan. But two species are recorded, both fishes of very small size, living in pools and ditches in the rice swamps of southern Japan, and doubtless feeding on mosquitos. The specimens examined were collected by the authors during 1900. They are in the United States National Museum and in the museum of Stanford University.

Family PŒCILIIDÆ.

Body oblong or moderately elongate, compressed behind, depressed forward, covered with rather large cycloid scales, which are adherent and regularly arranged. Lateral line wanting or represented by a few imperfect pores. Head scaly, at least above. Mouth terminal, small, the lower jaw usually projecting; margin of the upper jaw formed by the premaxillaries only; premaxillaries strong, extremely protractile. Teeth incisor-like or villiform, sometimes present on the vomer, but usually in the jaws only; lower pharyngeals separate, with cardiform or rarely molar teeth; third upper pharyngeal enlarged, the fourth wanting or united to the third. Gill membranes somewhat connected, free from isthmus; gill rakers very short, thick. Branchiostegals 4 to 6. Pseudobranchiæ none. Dorsal fin single, inserted posteriorly, of soft rays only, rarely with a single spine or a rudimentary spinous dorsal; candal fin not forked; ventral fins abdominal, rarely wanting; pectoral fins inserted low; no adipose fin. Stomach siphonal, without pyloric appendages. Air bladder simple, often wanting. Basis cranii simple. Sexes usually unlike, the fins being largest in the male, but in some species the females are much larger in size. Many of the species are ovoviviparous, the young well developed at time of birth. In these species the sexes are very unlike, the anal fin of the male being

developed as an intromittent organ. Fresh-water fishes of southern Europe, Asia, Africa, and America, some of them occurring in bays and arms of the sea. They are mostly of small size, and the species are very difficult of determination. The species are known in Japan as *Medaka*.

KEY TO GENERA.

a. Intestinal canal comparatively short, little convoluted; teeth little movable; bones of the dentary firmly connected; the lower jaw strong and usually projecting beyond upper; species chiefly carnivorous.
  b. Anal fin of the male similar to that of the female and not modified into an intromittent organ. Species oviparous.
    c. Teeth all pointed, none of them compressed or bicuspid or tricuspid.
      FUNDULINÆ:
        d. Ventral fins well developed; pharyngeal bones and teeth not enlarged.
          e. Teeth in villiform bands or at least in more than one series; no teeth on vomer; jaws short.
            f. Anal fin short, of about 10 rays, inserted behind last ray of the short dorsal fin. FUNDULICHTHYS
            ff. Anal fin very long, of about 20 rays, inserted before first ray of dorsal fin. ORYZIAS

FUNDULICHTHYS Bleeker.

Fundulichthys BLEEKER, Conspectus Syst. Cyprinorum, 1860, p. 439 (*virescens*).

This genus is imperfectly known. It appears to differ from the American genus or subgenus *Zygonectes* in having the small dorsal inserted wholly in advance of the equally small anal. According to the drawing of Bürger, published by Schlegel, the caudal fin is lunate. The single species is Japanese.

(*fundulus*, a related genus, *ἰχθύς*, fish.)

1. FUNDULICHTHYS VIRESCENS (Schlegel).

OMEDAKA (large killifish), **AKITABIRA** (autumn minnow).

Fundulus virescens SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 225, pl. CII, fig. 6.—NAMIYE, Class. Cat., 1883, p. 107 (Tokyo, Nagasaki).

Fundulichthys virescens ISHIKAWA and MATSU'ŬRA, Prel. Cat., 1897, p. 18 (Owari).—JORDAN and SNYDER, Check List, 1901, p. 58.

Habitat.—Brooks of southern Japan.

Schlegel's description of this species is based solely on a drawing by Bürger. B. 4, D. 9, V. 7, P. 14, C. 18. Length of head equal to depth of trunk at pectorals, nearly one-fifth of total length. Jaws with many series of teeth, the median teeth largest. Eyes moderate. Scales of moderate size, the lateral line (rather a lateral streak of color), nearer back than belly. Vent nearer tip of caudal than tip of head. Dorsal fin in the middle of the back; it is small, as is also the anal. Caudal fin a little notched. Pectorals inserted below the angle of opercle.

Color in life olive green, darker on the back, paler on the sides, whitish below; dorsal, anal, and notably the caudal orange yellow.

Length a little more than 2 inches. Very common in the brooks and little rivers which flow into the bay of Nagasaki. (Schlegel.)

We did not find this species, and no one has described it since the time of Schlegel.

(*virescens*, greenish.)

ORYZIAS Jordan and Snyder, new genus.

Oryzias JORDAN and SNYDER, new genus (*latipes*).

Body elliptical in form, compressed, covered with large scales; mouth small, with 2 rows of small, simple, pointed teeth; no teeth on vomer; gill opening not restricted above; intestinal canal short, about as long as body; peritoneum black. Dorsal fin short, inserted above middle of anal; anal *very long*, of 17 to 20 rays; caudal fin truncate. Sexes similar, except in color; anal fin not modified in the male.

This genus differs from *Aplocheilus* (= *Panchax*) of India in the short jaws and in the absence of teeth on the vomer. From *Zygonectes* it is distinguished by the *very long* anal. The African genus *Aplocheilichthys* approaches it, but is sufficiently distinct. Rice fields of Japan.

(ὀρύζα, rice.)

Type of genus.—Oryzias latipes.

2. ORYZIAS LATIPES (Schlegel).

MEDAKA.

Pœcilia latipes SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 224, pl. CII, fig. 5 (Nagasaki).

Aplocheilus latipes BLEEKER, Art. Soc. Sci. Ind. Neerl., VII, Japan, p. 99 (Nagasaki).—JORDAN and SNYDER, Check List, 1901, p. 57 (Yokohama); Proc. U. S. Nat. Mus., XXIII, 1901, p. 530 (Tokyo).

Haplochelus latipes GÜNTHER, Cat. Fish, VI, 1866 p. 311, (Nagasaki).—ISHIKAWA and MATSU'URA, Prel. Cat., 1897, p. 18 (Tokyo).

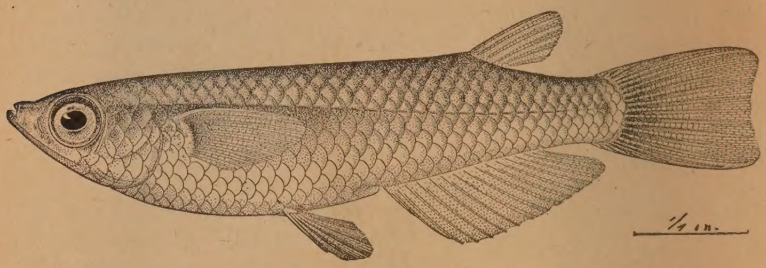
Habitat.—Rice fields and pools of Japan, north to Tokyo.

Head $3\frac{1}{2}$ in length to base of caudal; depth $3\frac{1}{2}$; depth of caudal peduncle $7\frac{1}{2}$; eye $2\frac{1}{2}$ in head; snout 4; interorbital space $2\frac{1}{3}$; D. 6; A. 17; scales in lateral series 31.

Eye very large, interorbital space flat, snout short, lower jaw slightly projecting. Gill openings not restricted above by membrane, the opening extending to upper edge of pectoral. Branchiostegals 5. Gill rakers on first arch 13, short and rather blunt. Jaws with 2 rows of simple, pointed teeth, those in posterior row minute and difficult to detect; vomer smooth; pharyngeals with minute teeth, mostly arranged in 12 or 13 transverse rows above, 6 or 7 below. Intestinal canal about equal to length of body. Peritoneum dense black within, the outer surface next to the body wall bright silvery. Top and sides of head, throat, and chin naked; lateral line absent. Dorsal fin short, its origin above middle of anal; its height equal to or greater than

distance between tip of snout and posterior border of eye, the depressed fin usually falling short of base of anal, in some cases reaching it. Anal base very long, the posterior rays highest, about equal in height to those of dorsal, extending to base of caudal when depressed. Pectorals inserted partly below median line of body, their length contained about $4\frac{1}{3}$ times in body. Ventrals pointed, short, just reaching vent when depressed. Caudal truncate, $4\frac{1}{2}$ in the length.

Color in alcohol, light brownish, the silvery coating of peritoneum showing through walls of abdomen; a narrow, median, dusky stripe extending along back from occiput to dorsal; sides of body sparsely stippled with black, the edges of scales dusky; a median, dusky line extending along sides of body from tip of pectoral to base of caudal; membranes of fins dusky, the color deepening toward the edges; ventrals black; a narrow light area on base of caudal.



ORYZIAS LATIPES.

The above description is of a male example. The female has a more slender body, especially in the region posterior to anal opening; the anal is lower and the ventrals are usually longer, often reaching beyond base of anal. The ventrals are immaculate or only slightly dusky. No modification of the anal rays appears to distinguish either sex.

Many specimens were secured from a stagnant pool at Wakanoura, and an equal number from a ditch in a rice field at Kawatana, on the bay of Omura, to the northward of Nagasaki, in company with the minnow *Rhodeus oryzæ*. Specimens were also received from Prof. Keinosuke Otaki from pools or brooks near Tokyo.

It is very common in all mosquito-breeding waters in southern Japan.

(*latus*, broad; *pes*, foot.)